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Can the Nation Defend its Forests?

THE *Daily Commercial Bulletin* of this city says it is incumbent upon Congress to protect the forests on the national domain, but adds that the plan we have proposed for their defense ignores limitations upon federal authority that must be maintained. The *Bulletin* does not say what these limitations are, but it appears to think it would be wrong for the nation to use adequate means for the protection of its own property. We are not aware of the existence of any limitations which forbid the nation to guard its forests from spoliation and destruction, and if the people of the country can be brought intelligently to consider the magnitude of the interests involved, they will, no doubt, find a way, or make one, to protect the forests on the public lands in the Pacific and Central States. There was much solemn argument in this country in 1860 and 1861 to the effect that the nation could not preserve or defend its own property; that there were insurmountable limitations in the way. But since 1865 intelligent men have mostly been of the opinion that the American people can defend their own national property—if they want to. There is nothing whatever to prevent the people of the nation from providing effective means for the preservation of the forests on the public lands, except the lack of popular interest, intelligence and foresight regarding the relation of these forests to the welfare and civilization of the country.

But the timber thieves, of high and low degree, who have grown rich by plundering these forests, the mining and railroad corporations and private individuals who for many years have been appropriating the public property to their own use and aggrandizement, are all earnestly opposed to the exercise of the power which the people of the country unquestionably possess—the power to defend the nation's forests from systematic and exterminating pillage. They would think it very improper, perhaps unconstitutional, to employ the army for this purpose, although its officers have been educated at the expense of the nation, and the whole force is maintained for the purpose of having a body of trained and competent men always ready for the service of the country; and the defense of national property is one of the principal objects for which the national army exists.

Is it not absurd to insist that although the nation owns these forests, and can dispose of them as it chooses, it cannot provide for the sale of the trees when they need cutting, but must allow mature and valuable timber to go to waste, or be stolen, because it would never do for the "Government" to sell lumber? The Government is already, and always has been, an extensive lumber dealer. It buys lumber in large quantities, while it permits enormous thefts of valuable timber from its own forests. The Government sells land, and old iron, and a great many other things. What kind of catastrophe would result if competent officers should be empowered to sell timber from the public lands, under regulations embodying some knowledge of forestry? The timber of the public forests is constantly sold with the land on which it grows. Of course, if the nation chooses to do so it can sell the timber, while it retains possession of the land and protects it so that a new forest-growth will in time be produced. To do this would be a very simple and commonplace business transaction.

There is not much force in the argument that because the nation does not employ the machinery of the "Government" to do something which is entirely unnecessary, that is, to manage mines and ranches, therefore it cannot, or must not, employ it to protect its property in the forests on the public lands. If the relation of certain mines and ranches on the public lands to the welfare and civilization of the country were the same as that of the mountain forests in California and Colorado, the nation could assume their management, and it would be entirely proper that it should do so. It could even employ its own soldiers to guard and defend its mines and ranches from plunder and destruction if this became necessary.

No well-considered objection to the plan for the care of the nation's forests, which was proposed in this journal a few weeks ago, has been brought forward. The unanswerable argument and sufficient reason for the adoption of that plan is the fact that it presents the only means available for the permanent conservation of forests which are the indispensable guards and regulators of the flow of the rivers which have their sources in them, and that upon these rivers a great area of country must forever depend for the water without which agriculture, and even inhabitancy, will be impossible.

These are the essential and intimately related facts in the case: A great region, now nearly uninhabitable on account of extreme desiccation, could be made highly fertile and capable of supporting a dense population, by means of irrigation. The water required for this purpose can be obtained only from the rivers which rise in the forest-covered mountain-lands which are still public property. If the forests are destroyed the water will not be available or controllable for irrigation. The forests are being rapidly destroyed, and under existing methods of government control their speedy extinction is certain. They belong to the nation, and could be protected by employing the national army for their defense, until a system for their permanent conservation could be devised and put in operation.

Tree-planting.

TREES are generally planted in this latitude during the month of April or in early May, although certain advantages may be gained by autumn planting. It is best, as a rule, to secure the trees in October, while nurserymen have time to fill orders properly, even if the planting is delayed until the following spring. As soon as the trees are secured all bruised roots should be carefully cut away with a sharp knife, and if the trees are carefully heeled in, the wounds will have time to form a callus and small rootlets will be made before freezing weather. These feeding roots will help to keep the tree supplied with moisture as it is dried out by the winter winds, and they will be ready

for immediate work when the tree is planted in its permanent position. The ground should also be prepared the previous season, broken up and deeply trenched by hand, if practicable, with the surface-soil left on the top. Next to trenching, the best practice is to dig holes for the trees in autumn. If the trees are to grow to large size, a hole three feet deep and twenty feet across is none too large. The soil should at once be returned to the holes with the surface-soil on the top, unless it is thin and gravelly, when good peat or mould should be thoroughly mixed with it. By planting-time the prepared soil will have firmly settled and small holes can be dug in the centre of the large ones. These should be considerably wider than the spread of the roots. One man should then hold the tree in an erect position while another spreads out the roots in their natural position, when finely pulverized soil should be dropped upon them, and, by a gentle movement of the tree, every cavity about the roots should be filled. It is essential that the soil be brought into close contact with the roots, and when the hole is nearly filled the earth should be trodden down, working from the outside of the hole toward the trunk of the tree. After this, the remaining loam should be thrown in and rammed down solid. No water should be poured about the newly-planted tree, but tall trees should be securely staked to prevent swaying and loosening the roots.

Trees will often survive when planted with less attention to details than is here recommended, but careless tree-planting is wasteful and disappointing. To be reasonably certain of having healthy, vigorous and long-lived trees, the work must be done thoroughly and intelligently. The rules here given are not new, but thousands of trees are lost every year by neglecting them, and they can hardly be repeated too often. We add a few other general directions which every novice should heed. Make a careful study of your ground, and decide exactly where each tree is to be planted before you send your order to the nurseryman. Never buy your trees first and then hunt for a place to put them. Never let the roots of trees, and especially of Conifers, become dry for an instant. It is good practice to dip the roots in thin mud as soon as they are unpacked, and then to keep them covered until the tree is planted. Dry weather and a moist soil are better conditions for transplanting than rainy weather and a water-soaked soil. It is generally a waste of time and money to transplant large trees. A tree with good roots and two or three feet high will soon overtake one that is transplanted when twenty feet high, or more, and will make a more beautiful specimen.

Special cases demand special treatment. Maples, Elms and Lindens, for example, have shallow roots, and larger trees of such species than of the more deeply-rooting kinds can be successfully transplanted. Trees with tap-roots, like Oaks and Hickories, should be planted when very small. Larches should be planted very early, because they are among the first trees to start into growth. It is safest to transplant Tulip-trees and Magnolias just after the buds have started, otherwise their fleshy roots are liable to decay while dormant. As a rule, Conifers can be transplanted later than deciduous trees, because they begin growth later. Better plant one tree well than a hundred without deliberation and care. Even a well-selected and properly planted tree will prove a disappointment if it is neglected.

A considerable share of public attention here has been directed of late to the trees in Central Park, through the efforts of a public-spirited, but in this instance imperfectly instructed, body of citizens, who have formed an organization to look after the interests of the upper part of the city. An expert representing this association has recently made a report concerning the cutting down of the trees in the park, and as this report has been circulated, and as the statements which it contains are calculated to bring discredit on the park officials among persons who are not familiar with the circumstances, it is proper to state that if they have erred at all in cutting it is in the direction of omission and not of commission. Many of the statements made by the expert of the West Side Association have no foundation in fact. In some cases he has failed to discriminate between the necessary pruning of trees and shrubs and their destruction; and he has made no distinction between the cutting out of dead trees and the cutting down of living ones.

The condition of things in Central Park, so far as the trees are concerned, is this: More trees were properly planted when the park was made than could grow eventually in the space allowed to them. It was intended, of course, that all these superfluous trees should be removed as necessity dictated. But this thinning, which the poor nature of the soil over much of the park made all the more necessary, was neglected for years, and the trees were allowed to grow up huddled together, without sufficient room, light or nourishment. Some native trees died from this cause, as well as many foreign trees which are now known to be unsuited to this climate, and which were planted in large numbers; and dead and dying trees even were allowed to remain to the detriment of more promising neighbors.

Two or three years ago the Superintendent found that a general system of cutting would have to be inaugurated all over the park, or that in a comparatively short time there would be few trees left. He sought and obtained the advice of experts, and proceeded with great caution to the task which public ignorance in such matters, and public clamor have made disagreeable and difficult. The cutting, up to this time has been confined principally to the removal of dead Conifers, particularly Norway Spruces, which are scattered all over the park, and to a few glaring cases of overcrowding about which there could be no possible question as to the propriety of removal. The number of trees which have been cut is large, perhaps, in the aggregate, but no proper impression has been made upon the plantations, and the work has been allowed to languish, probably because the fear of public outcry was too strong for the Commissioners. There are hundreds of good people who cannot be made to understand that an intelligent lover of trees will feel impelled to cut away an offending one whenever its removal will add to the beauty, the health and the longevity of half a dozen others. At the present time dead trees, or trees so nearly dead that a few years more will finish them, are allowed to disfigure the park, and a half-dead, misshapen Spruce, fast pushing really fine and vigorous deciduous trees out of shape is a common sight. Few parts of the park are not disfigured or injured by sickly, misshapen, or diseased trees, and it is the duty of the Commissioners to cause such trees to be removed. What they need is the support and encouragement of the public and the wild assertions which have been made in this city during the past month about destroying the trees in the park will, if they have any effect, retard well-advised and well-considered plans for its improvement.

The most important and valuable piece of work performed up to this time by the Board of Forest Commissioners of this state is the preparation of a bill (Senate Bill number 354) which will, if the Commissioners succeed in securing its passage, prevent railroad corporations from obtaining a location over the state-lands now held in the forest-preserve, or which may at any time in the future be joined to it. This is a matter of public importance deserving the careful attention of the members of the Legislature, and the support of all persons interested in the development and prosperity of this state.

The most immediate danger which now threatens the north woods comes from the railroads. A number of projects to extend lines already operated in the wilderness and to build new ones are now on foot; and their promoters are pushing them vigorously. The preservation of any portion of the Adirondack forests is due to their re-

moteness and inaccessibility to railroad communication, for it must be remembered that they are composed largely of hard woods, which cannot be made to float down the streams to the mills. The Pine and Spruce has been cut, or is rapidly disappearing, but the removal of these trees does not destroy the forest, unless fire, fed by the débris from the evergreens, is allowed to follow in the track of the lumberman. As long as the hard-wood trees which form probably nine-tenths of the Adirondack forest are not cut and are not allowed to burn up they will continue to perform those services which make these forests valuable to the people of the state. But if railroads penetrate the wilderness, every stick of hard wood which these forests contain will, in a surprisingly short space of time, be brought to market; while the danger of fire will increase in proportion as they are built. Fires will spread from the railroad locations far into the forest, and, as the region becomes more accessible, the number of fires set by hunters, campers and log-cutters will necessarily increase.

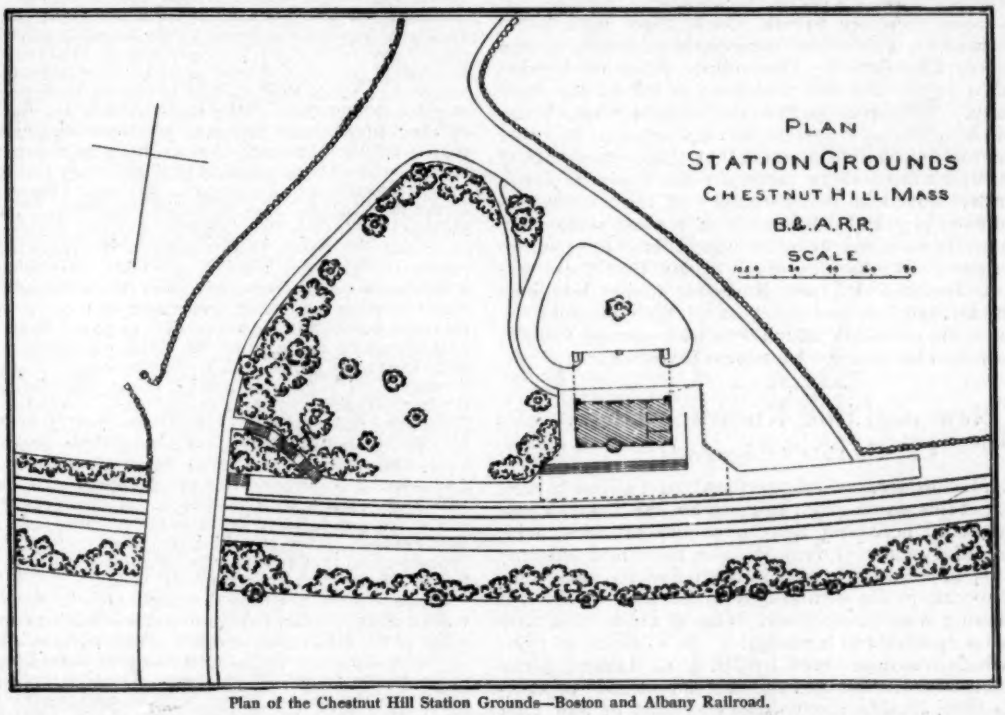
The creation of railroad lines over private property cannot be prevented, but the state is able to protect its own property, and it is not wise to maintain an administration to protect these forests, and then to give to private corporations the right to destroy them.

The Railroad-station at Chestnut Hill.

THE station at Chestnut Hill, near Boston, like the one at Auburndale, which we recently described, was built by the late H. H. Richardson for the Boston and Albany Railroad Company, and the grounds were laid out by Mr. Frederick Law Olmsted, and are cared for by Mr. E. L. Richardson.

This is perhaps the prettiest and most picturesque of all the great architect's rural stations, nor are its grounds equaled in beauty by any others. The road descends somewhat steeply towards the entrance of the grounds, and then more steeply after they are entered, while the building itself stands a little higher than the tracks, and is connected with them by a flight of steps extending across its whole length. Several fine trees ornament the grounds, including the White Pine shown in our picture, page 163, a clump of old White Willows, a branch of which is seen near the Pine, and a symmetrical American Beech that stands in the centre of the lawn opposite the carriage entrance. Another American Beech, the leafless form of which shows at the extreme left of the picture, stands in the grounds of a neighboring residence, which, of course, the landscape-gardener took care not to conceal from view. In other directions, as may be seen from the plan below, masses of foliage border the grounds. On the other side of the track, as at Auburndale, is a narrow strip of grass, edged with trees and hardy flowering-shrubs, and everywhere these masses are neither stiffly arranged nor scattered without purpose, but carefully grouped so as to secure variety in unity, interest, grace and harmony.

The extreme size and solidity of the arches which form the porch of the station have been criticized as inappropriate in so small a building. But we may recall what was lately said of Auburndale—a station is essentially a



Plan of the Chestnut Hill Station Grounds—Boston and Albany Railroad.

shelter, not a dwelling-place, and its roof is therefore of far more importance in giving it the right expression than its walls. These arches sustaining only a roof, would indeed be inappropriate in a house, but they can be permitted in a station even by the most exacting of purists, if he remembers the true purpose of the design. Nothing could be more beautiful than their vigorous, simple curve, and nothing could be more hospitable and protecting than the air they give the building. Nor is it a misleading air, for the comfort supplied by this great porch in wintry weather can hardly be exaggerated. In judging of these stations, it may be remarked, the same standards cannot be applied that would be justly applied in many other parts of the country. They are small because freight-traffic need not be accommodated; yet their approaches must be capacious and their porches must afford protection to considerable numbers of people at once, as the local passenger-traffic at certain hours of the day is very large. They are suburban stations, and everyone knows what that means in the neighborhood of a busy American city. And for the same reason it was appropriate to build them in a more costly manner than might have been wise in a really rural stopping-place. In this station, again, Richardson used granite

for the walls, Longmeadow sandstone for the trimmings, and slate for the roof. The treatment is as simple yet artistic, inside and outside the building, as we found it at Auburndale, but the waiting-rooms are wainscotted in wood instead of brick. In this case the conformation of the ground made it better to carry the pathway close to the walls rather than allow a space for planting between. Otherwise the path would have had to ascend the slope and descend it again at an inconveniently steep angle. But this conformation of the ground hides the path from many points of view and allows the walls to look as though they sprang directly from the plantations—an effect that will be increased at the spot shown in the picture by additional shrubberies which are to be set out this spring.

The business standpoint is not the highest from which to advocate the furtherance and development of good art. Yet it is a standpoint which few persons can wholly ignore, and least of all a railroad company, the directors of which are the custodians of its stockholders' interests. It is worth while, therefore, to ask, Could there be a better advertisement for a suburban neighborhood than a station and grounds like these? They imply refinement, good taste and a regard for the amenities of life in the local community. They predict that the company which has provided them will care for its patrons' comfort in other directions too. And they promise that those moments of detention which are a daily factor in the business man's existence will not mean that purgatory of impatience, disgust, and even physical distress which in most places they have meant for so many years to thousands of long-suffering Americans. It is not too much to say that these stations of the Boston and Albany Railroad, taking buildings and grounds together, are the best of their class in the world; and the company which was wise enough to build them has found them a good business investment.

New or Little Known Plants.

Calochortus Obispœnsis.*

THE Mariposaes, or "butterflies," of California well merit this name given to them by the Spanish settlers. Scattered here and there over the hillsides, with their wing-like petals of very diverse hues and patterns broadly expanded, they appear in truth like so many butterflies hovering in the sunlight over the low weeds and bushes among which they grow. One of the most bizarre of the many species and varieties is the *Calochortus Obispœnsis*, which was discovered by Mr. J. G. Lemmon, the well-known adventurous and successful collector of California, in 1886, on dry, stony hills eastward of San Luis Obispo. Its general habit and character are shown by our illustration, page 161—the deep-seated, fibrous-coated bulb, which is very dark-colored; the sparingly branched stem a foot or two high, as usual in the genus, with narrow convolute leaves and conspicuous flower. Of their coloring, however, no idea can be given in the figure. The sepals themselves are unusually strongly colored on the inner surface with orange and purplish brown upon a greenish-yellow ground. The petals are remarkable in not having the ordinary broad, fan-like form, but are shorter than the sepals and not much dilated, terminating quite abruptly and often cleft at the summit. The ground color is lemon-yellow, deepening to orange toward the base, and becoming brownish-red at the apex, the effect of which is heightened by a dense covering of long delicate hairs of the same or somewhat darker hues. Near the base is the usual roundish pit or nectary, which is margined by a dense fringe of long orange-colored hairs converging together over it. The erect filaments and anthers are of different shades of orange, the upper part of the filament being often tinged with purple. The whole combination is very peculiar and striking.

S. W.

* Calochortus obispœnsis, Lemmon. *Bot. Gazette*, xi., 180.

Foreign Correspondence.

London Letter.

LAST summer in England was a bad one for most plants. Our indoor collection of Nymphæas made few new tubers through lack of proper summer weather, and these few are small. We keep them moist all winter, as we keep Caladiums, Arisæmas, and indeed all deciduous or tuberous Aroids. They winter better when kept moist. Thousands of such plants as Caladiums are annually sacrificed to dry treatment. The tuberous Begonias keep best in dry sand or cocoa-nut fibre. To know what requires a dry rest and what must have moisture at all times is of great importance. For instance, one finds the greatest difficulty in making young men understand that whilst Hippeastrums and some Crinums must be kept absolutely dry all winter, Vallotas, Nerines, Brunsvigias and other Crinums must be kept moist. The watering-pot is the greatest friend the bulb-dealer has.

Poppies are now great favorites as garden flowers, but it is not many years since all such plants were rooted up from the garden as noxious weeds. A few here and there, and these invariably the exotic species, might be seen, but they were not popular. In the fields in autumn the great blaze of scarlet Poppy is a picture scarcely to be excelled anywhere. Some great traveler, Wallace I believe it was, has stated that not in any part of the tropical world had he ever beheld anything half so glorious as an English field of scarlet Poppy or a wood carpeted with Blue-bells. We have taken a leaf out of the book of the Chinese and Japanese gardener so far as regards our native Poppy (*P. Rhœas*) and we have as the result of a very few years' cultivation and selection a most beautiful strain of what in itself is a grand Poppy. By "we" I mean the secretary of the Royal Horticultural Society, the Rev. W. Wilks, whose Shirley Poppies are now in great demand, on account of their clear and rich tints. Nine years ago Mr. Wilks noticed in his garden a common field Poppy with a white-edged flower. From seeds saved from this plant he obtained varieties with more white in the flower, and others of a uniform pale color. By careful selection he succeeded in fixing the most distinct and attractive shades, and the Shirley Poppies are now available for every garden. The colors range from pure white through pink to glowing scarlet, minus the blotch of black at the bottom of the petals, a conspicuous character in the type. Some are red with white edges, others white with red edges. Singularly enough I brought seeds from South Africa two years ago which were said to be gathered from wild plants, and these produced flowers of *P. Rhœas* with bilobed petals, which were white with red edges. It is surprising that a plant which appears to have been unaltered in a wild state, during thousands of years, should have broken away from its color characters so readily under good cultivation and selection as has *P. Rhœas* in the hands of Mr. Wilks.

Hippeastrums are fast developing their flowers, about a week's clear weather being all that is needed to bring the majority of the kinds into full blow. Messrs. Veitch and Mr. B. S. Williams are the most famous workers at the improvement of these plants as garden flowers. Dean Herbert, greatest of bulb-mongers, raised many hybrids and seedlings, and Mr. James Douglas has been very successful in obtaining improved forms. The prices paid for good kinds of Hippeastrum are almost as high as the best Orchids fetch. Veitch and De Graaf, of Leiden, have been most successful in breeding large-flowered, clear-colored, well-shaped varieties, whilst Williams has paid more attention to form and color with medium size. Some of the latter are charming plants, without any coarseness, and perfect in color. I note one, a new seedling, named J. R. Pitcher, raised from a deep red-flowered kind, crossed with Mrs. Lee. The flower is medium in size, a perfect trumpet in shape, and the color deep crimson, with darker veins, the throat being almost maroon. Hippeastrums have become very popular here. The only defect in these highly-bred kinds is in their supposed weak constitutions; although the raisers have no difficulty in keeping the best of their productions from year to year. Coburgias are also in bloom now. These and the Stenomessons are of the choicest and most interesting of garden Amaryllids, but they are rarely met with. They are all Andean, and require the same treatment as the Hippeastrums, which they resemble in leaf and scape, but the flowers are long, tubular, drooping, with the limb about one and a half inches across. *C. luteo-viridis*, with flowers lemon-yellow shot with green, and *C. incarnata*, with rosy red, green-tipped flowers, are both in flower at Kew.

Growers of fruit trees, such as Apples and Pears, are paying particular attention to the selection of the most suitable stock for grafting the different kinds upon. Valuable statistics on

Fig. 101.—Calochortus Obispœnsis.—See page 160.

this question were collected and published by the Royal Horticultural Society in their Reports of the Apple and Pear Conferences held at Chiswick several years ago. Exhibitors were required to state with each kind of fruit shown the nature of the soil upon which it had been grown and the kind of stock used. The general opinion was greatly in favor of the Paradise and Quince stocks. Mr. G. Bunyard, of Kent, a most successful grower of fruit and fruit-trees for market, has recently discussed this question, and as his opinions on a subject interesting to your readers may be valuable, I quote them: "Now, I maintain that it stands to reason and common sense, that surface roots must receive the benefit of the rains, sun and air more than the anchor roots, which are, by reason of their position, more removed from such benign influence; and the teaching of fact in this case follows out the leading of logic, and we find by experience that Pears grafted upon the

Quince stock and Apples upon the Paradise can, do, and will produce handsome, clean, well-colored and full-flavored fruit, even in adverse summers, whilst in more propitious seasons the quality is super-excellent, and still proves our theory." The wild Pear stock, with its strong roots and few fibres, and the Crab-Apple stock, equally coarse-rooted, are used for trees intended for orchards, but they will not bear comparison with those recommended in the production of large crops and fine fruit in a short time.

'That those who plant Pears grow fruit for their heirs,
Is a maxim our grandfathers knew;
But folks have learnt since, if you graft on the Quince,
The fruit will develop for you."

A few days' sunshine would transform our Orchid-houses into paradises, but we must wait till April for the great flush. *Cypripedium Elliottianum* is now in bloom, and proves even better than my description of it a few weeks ago; *Odontoglossum Edwardii* bears its tall, branched spikes of purplish flowers, the nearest approach to true blue in an Odontoglossum; *Angræcum citratum*, with the most charming little wreath-like spikes of creamy-white flowers; *Ærides Vandarum*, truly a "thin" Orchid, although its pure white, curiously formed, large flowers are both interesting and pretty; *Dendrobium Ainsworthii* and its second, *D. Leechianum*, the handsomest of all hybrid Dendrobiums, and taking rank with the best of the genus; *Cœlogyne cristata Lemoniana*, and the pure white form, a pearl of snowy whiteness, and the new *Phalænopsis gloriosa*. These are the pick of what are in bloom now. I have recently seen some magnificent examples of Dendrobium which had all their old pseudo-bulbs cut away last spring and were apparently a great deal stronger for it. Pruning appears to be good for most of the strong growing Dendrobiums; at any rate I have seen it practiced on about a dozen kinds, which made stronger growth the season after. The rare and beautiful *D. Phalænopsis* apparently prunes itself, the pseudo-bulbs dying at the base the year after flowering. By fastening these to rafts of Sphagnum they are induced to develop offsets, and thus out of what looks like an evil, good may come.

Kew, March 9th. *W. Watson.*

Cultural Department.

Orchard Notes.

Hints on Grafting.—Any good whittler can make a scion live. But making a scion live is the smaller part of grafting when one operates on large trees. To secure a new top of good shape and proportions, which shall be easy of access, is a difficult matter. If one attempts to get the head very low, in order to make it convenient, he usually grafts too large limbs and sacrifices too many important branches. If, on the other hand, he aims to graft small limbs he generally makes a top which will be almost inaccessible—a series of what are called "mules' tails," long, naked branches with a bush on the end of each. That grafting is best which modifies the original shape of the tree the least. Stand at a distance from the tree and form an accurate idea of the shape the new top should assume. Then cut the main "stubs" at about the same distance from the body of the tree, using small limbs—say one inch in diameter—and many of them. Then fill in the top with "stubs" along the sides of the main limbs, in such positions that the symmetry of the head will be maintained and supports for the picker's feet will be secured. Use a great number of scions. Part of them may need to be cut out, perhaps one in nearly every "stub," as the new top becomes thick, but if the thinning is properly done good results will follow.

Shall we Whitewash Fruit-trees?—There are several reasons given for the practice. One man would whitewash to stop up the pores in the bark, that disease may not enter. But really the bark on the trunks of trees has no pores. Another whitewashes to protect the trunks from the hot sun—a wholly imaginary benefit. But the greater number whitewash without any reason. Something must be done to the trees, and whitewash is as cheap, handy and conspicuous as anything. Others whitewash to kill insects, and in this there is apparently some reason. But there are better washes for this purpose. The soap or caustic soda washes, with a slight addition of carbolic acid, are better. And if it is desired to soften up the bark on young and slow-growing trees—and this is often the chief benefit of a wash—whitewashes are of little avail.

Peach Yellows.—Yellows and yellowness should not be confounded. Yellows is a disease; yellowness is a condition. Yellowness may be due to poor soil, poor culture, borers, hard winters. It is amenable to treatment. Yellows is wholly different. It is communicable and does not submit to treatment. It has no relation whatever to soil-exhaustion or methods of culture. I have lost a whole orchard upon new ground. I have seen orchards set upon virgin soil die with yellows. One who has had wide experience with the disease cannot hold to the soil-exhaustion notion, if he is an honest observer. Prompt and radical removal of diseased trees will keep the disease in check. No other course has been successful. This has. No consideration should allow of dallying. It is time to stop quarreling about the cause of yellows, and check the evil by vigorous concert of action. The investigation of the yellows is one of the things which Peach-growers should demand of experiment stations.

Protection for Young Trees.—This is often needed, particularly on the surface of the soil, and for several reasons: To prevent soil from freezing too deeply; to prevent heaving; to prevent too great drying of the surface by winter winds; to keep trees from swaying in soft weather and forming funnels about the base which collect water. A mound of earth about the tree is good. Some mulch, in which mice will not nest, is good. Snow is excellent when it can be held. To hold it, dump a load of manure in a pile on the windward side of the tree, three or four feet from it. Snow will drift over the pile and persist about the tree.

Longevity of Trees.—Complaint is made that Apple and Peach-trees are shorter lived than formerly. It is probably true. It would be strange if it were not. High culture forces and develops a tree prematurely, as compared with natural growth, and stimulates production. This is, no doubt, in some measure at the expense of long life. But there is no occasion for lamenting the fact. Short life and much fruit is better than long life with the same amount of fruit. When trees begin to decline, cut them down. Younger ones are more profitable. A Peach-tree is seldom profitable after twelve years old, and a Plum-tree after fifteen or twenty.

Cornell University. *L. H. Bailey.*

Vineyard Notes and Studies.

BY the third spring after planting the vine will have growth enough to need the trellis. Remove all canes but the best one; prune this to three feet long and tie it to the wire. It may make what growth it will during the summer. Some vine-dressers, thinking that nature may be helped by art, practice "summer-pruning." It is needless and noxious. If one will try summer-pruning for a few years, and also leave a row of vines untouched, he will need no argument to convince him that to summer-prune a Grape vine is to do worse than waste time. Late next autumn the pruner may begin to shape the vine for growth on the trellis. Taking two of the branches grown from the main stem, as near as may be at the height of the wire, shorten them to six buds each. These branches will be made fast to the wire, and the vine when pruned will resemble a capital T. A few spurs, with one bud each, may be left near the crotch to grow renewal canes for next year. On the arms of the T not more than six buds should be left, because not more than six buds will grow. The vine always tends to push toward its extremities. If nine buds be left on a branch, the six nearest its end will start and the three next the trunk will probably remain dormant. In training the vine one must take care that it does not get beyond control. We often see vines with a long stretch of bare and unfruitful cane, a common result of stupidity in pruning. It is easy to keep the vine within bounds, maintaining growth of new wood and fruitfulness near its trunk. In pruning the vine for another year the canes which were made fast to the wire may be cut out and new canes from the spurs left near its middle may be laid on the wire. This is the "renewal system" of pruning, and suitable for varieties of the Labrusca family.

A Grape vine thus pruned will seem to have small chance left to bear fruit, but it must be remembered that each bud will form three or four clusters of Grapes, which should weigh about a pound each. Supposing twelve buds be left on the arms, and, say, six buds on spurs about the main stem; these eighteen buds may be counted on to set fifty-four clusters of fruit; too many for the vine, in vineyard culture, to carry.

The renewal system of pruning will not suit vines of the Riparia class. These must be pruned on the "spur system," and must be allowed to gradually extend themselves. The Clinton, the Oporto, the Ironclad will fruit best when pruned to spurs. The main arms may be gradually prolonged to one hundred feet in length. For some years I have had the fruit from a Riparia vine which stretches several arms more than a hundred feet each in length, and which yields yearly several hundred pounds of fruit. The Riparia vines should be pruned in autumn. If cut in February the vines will bleed, and the buds upon the spurs will not grow.

Anything more than general hints on the principles of vine-pruning is useless. To learn to do this well one must do it for some years, and notice results of his work. If he have the gift of observation and the capacity to learn from it he can prune vines intelligently. If he does not learn thus he never will. It is rare to find a good hand at vine-pruning. A poor one is worse than none.

The results of judicious pruning and training, on such a trellis as described (page 136), will be that in a few years the vine (of the Labrusca Grape, at least) will be fitted to stand alone, needing no trellis support. Thus, a considerable expense per acre is saved, and, with Grapes at ten dollars a ton, there will be less loss in their production.

Chestnut Hill Station, Boston and Albany Railroad.—See page 159.

For the Riparia vines a trellis is necessary, or they may climb over trees. They demand room to spread themselves, and then will produce liberally. The flowers of the Riparia vines have reflexed stamens, and seem to be benefited by pollenization from other sorts, although I cannot understand why.

Vineland, N. J. *A. W. Pearson.*

The Flower Garden.

THE month of April should be a busy time among hardy, herbaceous plants. All dead foliage should be removed and a light top-dressing of well-decayed manure or leaf-mould applied and lightly forked in; care should be taken, however, not to fork where bulbs are planted. Any additions to the hardy plant-border should be made as soon as possible, and this is especially advisable in the case of all kinds of Lilies, for if these are not planted, early root-growth commences, and the prospect of good flowers the first season is not promising. When planting the more tender Lilies, it is advisable to prepare a bed and arrange each kind according to its height, and in fall, when they have died down, place a frame over the bed, fill with dry leaves and cover with shutters. In this way all the tender kinds, including those from California and *L. longiflorum*, *L. Harrisii*, *L. giganteum*, *L. Brownii* and choice varieties of *L. auratum*, may be wintered with safety.

Plants that need division (and many kinds thrive better when periodically lifted), such as the tall Phlox, Day Lilies, *Iris Kæmpferi* and *I. Germanica*, should be taken up and divided with a sharp knife. The soil should be enriched before replanting, for such plants are gross feeders. Delphiniums, to succeed well, need a moist soil. If the soil is sandy, and liable to dry out in summer, even heavier soil, as clay, should be added. With this treatment even the best double kinds will thrive and be perennial. Choice Alpines, such as Androsaces, *Gentiana excisa*, *G. verna*, *G. aculis*, *Dianthus glacialis*, *D. neglectus* and *Arabis Androsace*, should be examined. They will probably be lifted by the action of frost. When such is the case, make them firm, and place a little fresh soil on the surface, and if pieces of porous stone be placed round the plants they will not be liable to injury from heavy rains or dry spells. Hellebores are becoming popular, owing to their season of flowering. These are deep-rooting and need to be planted where they will be sheltered from direct sunshine. We find them succeed best when planted in this way, and when the ground is dug deep and lightened with plenty of leaf-mould. Any bare, dry places should be planted with *Pyrethrum Tchihatchewii*. This will form a nice carpet even on a dry bank; and for shady places, such as under trees, where grass will not succeed, *Vinca minor* and its varieties may be used, and when planted a foot apart a good covering will be the result the first

season. Such perennials as may have been raised from seed, should, when large enough to handle, be pricked out in pots, and when well rooted be planted in their permanent positions. Seedlings of many kinds when treated in this way flower well the first year.

Passaic, N. J. *E. O. Orpet.*

Orchid Notes.

Lælia bella.—This is the most magnificent hybrid yet produced, combining the excellent qualities of *Cattleya labiata vera* and *Lælia purpurata*, both of these being the best representatives of their respective genera. In richness of color it is far superior to both. The habit and general appearance of the plant greatly resembles *C. labiata*, but the bulbs are more slender and the leaves longer and narrower. The flowers are about nine inches across, and of a uniform rosy purple. The large handsome lip is a rich amethyst purple, deepening to a much darker shade towards the front, while the orange throat is beautifully penciled with crimson. They exhale a delightful primrose fragrance. This very rare hybrid first flowered with the raisers, Messrs. Veitch & Sons, in 1884, and I believe only two plants are as yet in this country.

In strong contrast to the foregoing is the pretty dwarf-growing *L. Lindleyana*, a plant seldom seen, and which is probably somewhat rare in its native habitat in southern Brazil. The slender bulbs usually have two very thick, leathery and narrow leaves, light green and dotted with purple. The short peduncle bears 3-4 flowers about four inches across, with nar row, pure white segments, blotched and spotted with rosy purple, the front lobe of the lip being of the same color. This plant does well in an intermediate temperature, and thrives best in a basket with very little soil about the roots, enjoying abundance of water during the growing season.

Another Lælia from the same region as the preceding, and now in full bloom is *L. harpophylla*. This Orchid was, until the last few years, very rare, but large importations have now rendered it within the reach of all. It is a very showy plant, producing from the apex of its slender stems clusters of some half dozen orange-scarlet flowers. These are about two inches across, with narrow segments. The long, narrow, front lobe of the lip is recurved, edged with white, and has a very crisp margin. This Orchid will be found very useful for cutting purposes, and a few plants of it with its rare and showy color assist greatly in brightening the more sober tints of its congeners. It requires about the same treatment as *L. Lindleyana*, except that it is more suitable for pot culture, and should be constantly syringed, as it is somewhat subject to the attacks of yellow thrips.

Lælia Pitcheriana is another garden hybrid, now prettily in bloom. It is the result of crossing *Lælia Perrinii* with *Cattleya crispa*. The character of its growth is intermediate between these two, but the flowers are very much like those of the Cattleya. They are of wavy outline, white, flushed with rose, and the lip is white with a large purplish blotch on the anterior lobe. The variety Alba (also in flower) is devoid of this blotch on the lip. This plant grows freely with us among the general collection. It is still very rare, although it was first flowered in 1868.

Angræcum cryptodon.—This rare plant resembles in habit and foliage *A. Sanderianum*, producing a loose raceme about one foot long, bearing about a score of flowers. The narrow sepals are of cinnamon color, terminating in a spur of the same color about three inches long, the broader petals and ovoid lip being pure white. This peculiar combination of color renders the Orchid very interesting as well as attractive. It is a native of Madagascar, and like other species from that country luxuriates in strong heat, with a maximum of moisture, and it may be grown in a basket filled with charcoal and moss.

Cochlioda (Odontoglossum) *rosea* is an attractive little Peruvian Orchid, with drooping racemes, which bear a score of rosy, carmine flowers about one inch across, the top of the column being white. It grows in dense masses, and bears abundant flowers, which last a long time. The cool-house suits it best, with a liberal supply of water at all seasons. *F. Goldring.*

Kenwood, N. Y.

Propagating the Weeping Sophora.—It is well known to nurserymen and landscape-gardeners that no adequate supply of good, clean specimens of this beautiful and useful weeping tree has yet been accessible, and the sole reason for its scarcity has been the difficulty of getting straight and smooth stems of sufficient height upon which to graft the drooping variety. No trouble whatever is met in grafting or in getting a strong growth of the top, when once a stem tall enough to use is secured. We have learned, by accident, as many such useful things are learned, to produce tall, clean, unbranched stems, of six to nine feet, in one season, at little expense, by the following method: The Sophora, like most Japanese plants, loves a moist atmosphere, and will grow extremely fast in a close, moist place. In spring, after the green-houses are emptied, plant dormant Sophoras, about three-fourths of an inch in diameter, in the earth-bottom of the house, which should be made fairly rich. Cut them back to the crown and set them one foot apart each way, and by December 1st they will be out of the top of the house, and as smooth as willows. Then lift and keep them protected in a cellar or frame, or heel them deep in a well-drained place till spring, when they can be planted in nursery rows and grafted at the same time, with most gratifying results.

Cambridge, Mass. *F. L. Temple.*

Plant Notes.

Cytisus capitatus.—This charming little compact-habited bush, with its dull green, hairy, trifoliolate leaves and terminal corymbs of yellow flowers, has attracted the notice of some continental nurserymen who have worked it on tall stems and exported it to England under the name of *Cytisus nigricans nana*. *C. nigricans* is a taller-growing plant, with long, erect racemes. *C. capitatus* is found wild in some of the mountain districts of southern France, Switzerland and in central and eastern Europe. It flowers in England from July onwards, and, according to Loudon, was first introduced to cultivation in 1774.

Genista virgata.—One of the most beautiful of all the showy leguminous shrubs in the Kew Arboretum is, without doubt, the subject of this note. Although a native of Madeira, it seems with us quite as hardy as our native Broom (*Cytisus scoparius*). In spite of its merit the species is far from common; it has small leaves and slender branchlets, every one of which is terminated in July with an upright, golden raceme. There are numerous old specimens at Kew from six to eight or ten feet high and as much through, and these must have successfully passed through many winters which left their mark on not a few of our indigenous trees and shrubs. In some gardens *G. virgata* is cultivated under the name of *G. elata*, which really represents a widely different plant, and is nothing more than a vigorous form of the European *G. tinctoria*, a pretty perennial with a woody base.

Royal Gardens, Kew. *G. Nicholson.*

Principles of Physiological Botany as Applied to Horticulture and Forestry.

XIV.—Reproduction in the Higher Plants.

BY means of the multiplication of cells and their increase in size, all growth takes place in the vegetable kingdom. This process of growth can take place, under certain conditions, in parts which have been completely separated from the plant, for instance, as cuttings, tubers and many other underground structures. Moreover, as is well known, it is possible to transfer certain separated parts to other plants with which they unite, after which, both the stock and scion, continue to grow as one. That which is common to the growth of such separated parts, whether they are placed in the ground, as in the case of cuttings, or grafted or budded on some other plant, is this: all the individual peculiarities of the parent plant from which the fragment was derived, are perpetuated with little or no change. In other words, all these fragments have carried their ancestral peculiarities with them, and, as the cells of which their buds are composed multiply and increase in size, they obey all the traditions of their parentage. Hence, in general, propagation by means of buds is a sure way to continue the cultivation of a special variety, and for this reason we perpetuate our choice varieties of fruits preferably by grafting or budding. We recognize the fact that with the planting of the seed we are very likely to obtain some deviation from the straight line in which the desirable variety has come down to us.

It must not be thought, however, that there can be no variation in propagation by buds. It occasionally, though rarely, happens that a bud or a shoot will manifest a capricious divergence from the ancestral traits; and, what is harder still to understand, in some cases the scion may be affected by the stock on which it is grafted. In still others, however, it may affect the stock. But these cases are exceptional in the highest degree, and do not invalidate to any extent the general statement that the bud is relied upon to keep the variety true, while it is to the seed that we look for variation.

It is necessary that we should now glance at the structure and the office of the flower; that mechanism by which in the plants which are called the *higher*, seeds are produced.

The flower, for instance, in the case of flax, consists essentially of a branch with leaves arranged in definite order, but all so changed in their character that they are readily distinguished from ordinary foliage leaves. With the exception of the outer circle of floral organs (which are frequently much like green leaves), the parts of the flower are of very delicate texture and possess some color unlike that of the outer row. Within the highly-colored crown, or corolla, of the flower, we come to the male organs of the blossom, known as *stamens*, which consist of slender threads, each bearing at its summit a minute sac filled with the fine grains of *pollen* or fertilizing dust, by which the *ovules* (delicate roundish bodies in the central organ of the flower) are to be impregnated. The central organ, termed the *pistil*, bears the ovules in a closed case, known as the *ovary*, which is surmounted by a thread-like prolongation at the summit of which is the *stigma*, a receptive sticky surface to which the pollen clings.

The pollen, or male element of flowering plants, consists of microscopic grains which vary considerably in size, shape and sculpturing of the surface. The forms and markings in a few instances are so characteristic that they may be employed for distinguishing large groups of plants, but in general the grains are merely round or ovoid, and have no very distinguishing features. Pollen grains are either simple or compound, the latter sort found in comparatively few species. One of the most interesting forms of clustering of grains is found in the milk-weeds and in the Orchid family, some of their clusters being provided with minute stalks and sticky discs, by which they can be carried by insects from one flower to another.

A vast amount of pollen shed by some of our forest trees and shrubs is scattered far and wide by the wind, borne, one may say, at random, with only the merest chance of any of it falling on the female flowers of the same species. And yet, as matter of fact, it is waste with good results; for out of the prodigality successful fertilization is secured. It is a familiar fact that the amount of pollen collecting on the shores of our northern lakes is so great as to attract attention from the sulphur-yellow color which it imparts to the water. With the pollen grains which collect on the shores there are generally commingled the spores of some of our lower plants, notably those of Lycopodium, or Christmas evergreen. These spores are enveloped in a delicate film of resinous matter, which makes them water-proof for a long time, and causes them to burn with a flash when they are brought into contact with flame. In this way they can be distinguished from the pollen with which they are mixed.

At the opening of a flower, the pollen, borne in some way, either by the wind or by insects, reaches the sticky stigma, to which it adheres. After a variable time, there protrudes from the pollen-grain a microscopic tube, containing protoplasm or living matter. This tube descends through the style to the cavity of the ovary, where it comes into contact with the ovule. For every ovule, there is supposed to be required, at least in nearly all cases, one pollen tube. The ovule possesses an intricate structure which, in its simplest form, may be said to be a sort of minute vegetable egg (in fact, the word ovule means this very thing), containing in one part a cell somewhat larger than those surrounding it. This larger cell contains, as do the other smaller ones, protoplasm or living matter, but the protoplasm in this larger cell presents certain peculiarities of form which need not be further described. It is sufficient to say that one part of this protoplasm becomes affected in a remarkable manner by the protoplasm in the pollen tube, and, as a result of this action, the former begins to divide and subdivide, the other cells of the ovule undergoing changes, but of a less remarkable character. The dividing contents of the large cell of the ovule become sooner or later distinguishable as forming the embryo or germ, and associated with this is a certain adequate amount of food, all being enclosed in the hardening ovular coats, which become the integuments of the seed.

Unless the ovular protoplasm is acted upon by the contents of the pollen tube, the globular body withers away and comes to nothing. Contact of these two diverse elements is requisite to the formation of the germ within the seed. There are a few anomalous cases known as those of *parthenogenesis*, in which germs appear to be produced without the action of pollen, but these are so very exceptional that they may be disregarded in the present treatment of the matter.

After the seed begins to ripen, concomitant changes take place in the ovary, the whole ripening into the fruit. The fruit may be defined as the ripened ovary; the seed may be called the ripened ovule. In the ripening of the fruit there is generally more or less change in the neighboring parts, and these modified parts may become conjoined to make what is popularly called the fruit. For instance, the Strawberry consists of a thickened pulpy stalk, which has acquired sweetness and a delicious flavor. Upon this rounded or conical fruit-stalk are borne numerous ripened ovaries, which seem so much like seeds that until one cuts them open he is unwilling to believe that each is a fruit-case holding a seed.

Ripened seeds and fruits bear some curious relations to each other. For instance, it is rare to find any ovary containing more than a couple of seeds, which is incapable of opening and discharging some of its seeds. On the other hand, fruits which have only one or two seeds are very apt to remain closed even when they are "dead ripe." The bearings of these relations on the manner of dissemination can be easily thought out by any observant person who will note the different sorts of fruits and the numerous contrivances which they possess for distributing their seeds. In connection with this it should be said that one-seeded fruits are often furnished with some means for dissemination, such as by wings, plumes, hairs, hooks, claws and the like.

If one were to examine the flowers of our common forest trees in the hope of finding such flowers as we have described in the case of the flax, he would be disappointed. A few have showy blossoms, like the Magnolia, Tulip-tree, and Catalpa, and, among shrubs, Rhododendron, Azalea, and so on, but these are exceptions. Most of our trees have flowers which are very much reduced in numerous particulars, but all of them agree in this: that they contain either the male organs, the pollen-bearing stamens, or else the female organs, the pistils with their ovules, or in very many cases, both of these in the same flower. But the flowers of trees at the North are, as a rule, brought down to very narrow limits as regards color and complexity. Nevertheless, since they possess the essential elements of the flower, they can produce seeds with germs, and hence carry on that form of reproduction by which variation is introduced into the line of succession.

In conclusion, it may be said that a seed is an embryo plant, supplied with a sufficient store of food and provided with a protecting case. It has also been given some means by which it may be carried to some distance from the parent plant, thus lessening competition.

Cambridge, Mass. *George Lincoln Goodale.*

The Forest.

Forestry in California.

THE following extract is taken from the last report of the California State Board of Forestry. The report was prepared, we believe, by Mr. Abbot Kinney, of whose efficient services the state has recently been deprived:

The débris of the hydraulic mines in this state is infinitesimal and harmless in its damages compared to what must occur if the high Sierras are unduly denuded of their forest covering. In such case the rains must flow off more rapidly and the snows melt more suddenly than at present. Thus the perennial value of the streams for irrigation must diminish, and sudden and destructive floods are certain to occur. The histories of such countries as Palestine, Persia, Greece, North Africa, Spain and the south of France demonstrate the results of unwise forest extinction, especially upon the mountains. That California will prove no exception to the rule is shown by the instances of the diminution of springs and streams, and by the formation of torrents in this state due to forest destruction, collected and presented with time, place and witnesses in our last report. Now that these mountain water-sheds in forests so important to the irrigators, farmers and consequently to all persons in the state have generally passed into private hands, there seems but one way left to deal with the question. This way is by education of the people, to demonstrate that a wasteful and unscientific destruction of forests upon certain critical points of important water-sheds, while temporarily beneficial in a gain of a few thousand dollars to some individuals, threatens the loss of millions of dollars of property to others. Thus the carelessness or improvidence in the mountains of one man may destroy the property and means of livelihood of thousands of his fellow citizens in the valleys below. This point established, legislation in the line of the forestry laws of other experienced and civilized countries can be had. We will then have a reasonable regulation of lumbering methods, upon important water-sheds of the state, with a view of preserving the integrity of our springs and streams for the pro-

ductive interests of the state. No doubt a cause of action would lay against any one who by such use of his own forest property did damage to his neighbors, either by diminishing their water-supply or by so suddenly augmenting it in the form of torrents as to destroy their property. Such remedy will be the state's last resort, and can only be relied on after great damage has been done. Wise measures should prevent such serious injuries to the people. The active attention of the Board has been given not only to the preservation of our forests, but also to the planting of trees for economic and ornamental purposes. Our native trees have been too much neglected, but with the exception of the Monterey Pine they are generally of slow growth, especially in dry situations. The foreign trees introduced have disadvantages in most cases, and that extraordinary grower, the Blue Gum, of Tasmania, is not capable of supporting the frosts of many of our interior points, nor the excessive drought of others. It happens that the very places where trees would be of the greatest advantage are those where the trees usually relied on for planting will not succeed or do but poorly. The Board has endeavored to remedy this condition by the introduction of other trees suited to the more difficult climates of the state. After extensive correspondence, the Board felt justified in recommending several trees as being better able to resist excessive drought and to grow with reasonable rapidity than any we had hitherto tried. The trees recommended were the Locust, Catalpa, *Eucalyptus viminalis* or Manna Gum, the *Eucalyptus leucoxylon* or Blue Gum of South Australia, and the *Eucalyptus corynocalyx* or Sugar Gum. Taking all things into consideration, the last is probably the best. Our recommendations were largely based on the experiments of the forest department of South Australia, under the able direction of Mr. J. Edine Brown. His department has planted a number of stations with trees in the dry interior of Australia, where the climatic conditions bear a close resemblance to those in the drier portion of our state. While in these extreme stations the Blue Gum of Tasmania (*E. globulus*) did not do well, the other trees named flourished beyond expectation. These trees and even their seeds were not to be had in this state. The Board, therefore, imported seeds from Australia, and distributed them free throughout the state. Many successful plantations are the result. No tree has been found to grow more rapidly in situations suited to it than the common Blue Gum. Experiments by a member of the Board show, however, that there are other trees not very inferior in this respect, while much more valuable in other qualities. Two trees planted from the pot, six inches high, in the middle of August, a year ago, at Santa Monica, nineteen months from the seeds and fourteen months from the transplanting, are now respectively fourteen feet six and a half inches and fourteen feet six and three-quarters inches in height. One of these trees is a *Eucalyptus corynocalyx* (Sugar Gum) and the tallest a *Eucalyptus viminalis* (Manna Gum). A tree of the *E. gomphocephala* (Tooart Gum) of the same planting is fourteen feet one inch high. It must be said, however, that the soil and climate of Santa Monica are especially favorable to almost all forest trees.

Periodical Literature.

Professor L. Wittmack, of the Landwirthschaftliche Hochschule at Berlin, has recently contributed to the *Berichte der deutschen botanischen Gesellschaft* an important paper on "*Die Heimath der Bohnen und der Kurbisse*" (The Home of the Bean and the Pumpkin). He says that as early as the year 1879 he expressed the opinion that the Garden Bean of Europe (*Phaseolus vulgaris*) was not of Old World origin, but came from the New World, the remains from the ancient Peruvian mummies brought from the necropolis at Ancon by Drs. Reiss and Stübel, entrusted to him for identification, having led him to that belief. Later, in the meeting of naturalists at Danzig, and before the Agriculturists' Club at Berlin, he had spoken more positively. He had at the same time endeavored to point out that what the ancients had called *Phaselos*, *Faseolus*, etc., was in all probability a sort of *Dolichos*, and Professor Körnicke had, in consequence, further shown that it was *Dolichos Sinensis*, or a variety of the same, *D. melanophthalmos*. Professor Wittmack further observed that the word frizol or frisol, from which the Spanish frijol, the German fisolen, etc., had come, was an American word, and, according to Reiss, was of West Indian origin; unfortunately, it had an accidental resemblance to the Greek and Latin *phaseolus* in sound.

Alphonse De Candolle had shown that *Phaseolus vulgaris* had no Sanskrit name, and therefore its origin must be in western Asia, but there it had never been found. It is, therefore, almost incomprehensible that the idea of its American origin should not have been conceived, particularly when, out of the sixty different sorts of Phaseolus there are twenty-eight native to Brazil alone, mostly of the large varieties. Had the old writers who relate the story of the Spanish conquest been studied, the opinions would have been different. Acosta mentions two kinds of Beans, Garcilasso de la Vega speaks of three or four kinds. Oviedo (1525–38) alludes to them in San Domingo, the other islands, and still more on the continent; in the province of Nagranda (Nicaragua) he has seen hundreds of bushels gathered, and in another place he observes that they are indigenous. Cabeza de Vaca found frisoles in Florida in 1820, and, in 1835, in the northern limits of his journey in New Mexico and Sonora. He mentions them repeatedly, mostly in connection with Pumpkins. Pedro de Cieza de Leon describes them as cultivated in Popaya (Colombia).

Alphonse De Candolle, in his classic work "*L'origine des plantes cultivées*," after citing the observation of Professor Wittmack, says: 1. *Phaseolus vulgaris* has not long been cultivated in India, south-western Asia and Egypt. 2. It is not certain whether it was known in Europe before the discovery of America. 3. At this epoch the number of varieties in European gardens suddenly increased, and all authors began to mention it. 4. The majority of the varieties of the genus exist in South America. 5. Seeds apparently belonging to this kind have been found in Peruvian graves of uncertain age (meaning whether before or after the conquest), but mingled with many plants, all of American origin. At the end of his book he places *Phaseolus vulgaris*, to be sure, among the three plants whose nativity is either wholly unknown or uncertain. The two others are *Cucurbita moschata* and *C. ficifolia*, Bouche (*C. melanosperma*, Al. Br.).

In the meantime two high authorities have likewise pronounced for the American origin of the Garden Bean—Asa Gray and Hammond Trumbull. According to them, Columbus found, three weeks after his arrival in the New World, near Nuevitas, in Cuba, fields of *faxones* and *fabas*, very different from those of Spain, and two days later, on the north coast of Cuba, again land "well cultivated with *fexoes* and *habas*, very different from ours." Faxones or fexoes are, as the editor of the journal, Navarrete, notes, the same as "frejoles" or "judias," the Spanish name for *Phaseolus vulgaris*.

De Soto found in 1539, on his landing in Florida near Tampa Bay, fields of Maize, Beans, and Pumpkins in great quantities, and the same elsewhere. Jacques Cartier found Maize and Beans among the Indians at the mouth of the St. Lawrence in 1608. Lescarbot speaks of various kinds of Beans among the Indians of Maine, Virginia, and Florida, planted between the hills of Maize; Lawson, in his voyage to Carolina, 1700–1708, says that the Kidney Beans were here before the English came, very abundant in the Maize-fields. The "Bushel Beans," a wild kind, very flat, white and with a purple spotting, were trained on poles. Asa Gray and Trumbull here say in parenthesis (*Phaseolus multiflorus?*), but Professor Wittmack thinks *P. lunatus* must have been meant. Lawson mentions further: Miraculous Pulse, so-called on account of the long pod and the great yield, very pleasant in taste; and further, Bonavies, Calavancies, Nanticoches, and an abundance of other kinds with pods, too numerous to mention, which we found the Indians possessed when we first settled America.

The Beans in the Northern States were named Indian Beans, in contrast to the Sow Beans introduced by the English, which were called Garden Beans.

In no Egyptian sarcophagus and in no pile-structure of Europe have Garden Beans been found, says Professor Wittmack; whereas the Sow Beans have been, though only recently, and very few in the Egyptian graves, since they were regarded as impure. He also points to Sow Beans in the collections of Schliemann and Virchow at Hissarlik (Troya), and by Schliemann at Herakleia.

"On the other hand, I have now had the good fortune to find prehistoric seeds of *Phaseolus vulgaris* from North American graves. At the International Congress of Americanists held in Berlin from October 2d to 5th, Professor Edward S. Morse, of Salem, and Mr. Sylvester Baxter, both delegates of the Hemenway Expedition, showed a portion of the collections made by that archæological undertaking, which was instituted by a lady of scientific enthusiasm, Mrs. Hemenway, for exploration in the south-west of North America (Arizona). Among the specimens were some examples of Maize from Los Muertos on the Rio Salado, in loose, charred kernels, together with a thin cob exactly resembling the prehistoric Maize from the mounds in Ohio. But who can depict my astonishment when, with the permission of Dr. Uhle, of the Museum für Völkerkunde, I examined the litttle box of Maize somewhat more

closely and found therein indubitable Garden Beans, besides some fragments of a pod somewhat resembling in shape a string of pearls? The latter, which is distinguished by strong, forked, netted veins upon the surface, I would regard as *Prosopis glandulosa* (*Algarobia glandulosa*), the so-called Mesquite. It is six to seven millimeters broad, two to three thick, and agrees very well with the figure of the same in the annual report of the Commissioner of Agriculture for the year 1870, Washington, p. 410, plate XXI., although no veins are shown on the latter, which is only superficially drawn. The Mesquite is to-day an important article of food for the Indians in the desert. The fruit is eaten like St. John's Bread; also ground and mixed with water, eaten as porridge or (unbaked) bread. The seeds of the Garden Beans that I found are all small, much smaller than those from the Peruvian graves, which compare with our larger and largest kinds. The smallest from Arizona are only 6.7 millimeters long, 3.8 wide, 2.9 thick; the largest 8.9 millimeters long, 4.8 broad, 3.2 thick. Many Beans are split in consequence of the charring.

Among these halves is a very large one 10.3 mm. long, 6.3 broad and 2.7 thick. We have yet to-day many Pearl Beans as small as this. The prehistoric Beans would also appear somewhat larger if the hull of most of them were not lacking. When hulled, a modern Bush Bean, "round, pale yellow wax," in form corresponding to the last-mentioned half Bean, has a length of 10.4 mm., breadth of 6.0 and thickness of 4.0, and a "white Pearl Bean" from the collection of Von Marten, unhulled, is only 7.5 mm. long, 4.7 broad and 3.4 thick. This latter corresponds most nearly to the prehistoric example; and, accordingly the Bean from Arizona is to be regarded as a Pearl Bean, *Phaseolus vulgaris saccharatus*, Von Martens (the Garden Beans, No. 97), which belongs to division VI., Ellipticus, the Egg Beans. Prehistoric Beans, so far as I know, have not until now been encountered in America. The present discovery is, therefore, of universal interest, and it confirms the American nativity of the Garden Bean. That it is in reality the latter with which we have to do in this case, is shown by the agreement in the position and shape of the root germ as well as the plumula. In certain of the split Beans are to be seen very plainly both of these characteristic primordial leaves."

In regard to the Pumpkins, Professor Wittmack first calls attention to the fact that Naudin, in his monograph on the subject, holds all three of the cultivated kinds, *Cucurbita maxima*, *C. Pepo* and *C. moschata*, to be of Old World origin, and in his *Nouvelle recherches*, 1856, he says that *C. Pepo* was perhaps known to the Greeks and Romans, but the introduction of the other two in European gardens does not appear to go back over two centuries. De Candolle remarks that the historical data do not disprove, neither do they support, the American nativity of *C. Pepo*, and at the end of his work he classifies it as American. *C. maxima* he regards as native to the Old World, but allows that it has been found by Barter only "apparently wild" on the banks of the Niger in Guinea. Professor Wittmack was personally assured by Professor Schweinfurth, however, that this observation amounted to nothing, for Pumpkins were now always found wherever there were negroes, who now cultivate them extensively. Professor Wittmack had found seeds of *C. maxima* of normal size, and of *C. moschata*, in the Peruvian collections from Ancon; it therefore seems that America must be the home of these, and when De Candolle is disposed to regard *C. Pepo* as American, his designation is perhaps better to be applied to the very similar *C. moschata*. Nothing of the Pumpkin kind has been found among the ancient Old World collections, and there is no recognizable description of them before the discovery of America; they are first encountered in the sixteenth century. Gray and Trumbull have shown that there were Pumpkins in the land of the Hurons before the arrival of the Europeans. Professor Wittmack has examined their references, often in the original where they only had an English translation. This was essential, since the Spanish word *calabazas* was not always to be translated by the English Pumpkin; it seems as if the Bottleneck Squash, Lagenaria, were often meant. But when, for instance, De Soto, in 1539, declares at Apalacha, in western Florida, the *calabacas* of Uzachil to be better and juicier than those of Spain, he cannot have meant Lagenaria. Professor Wittmack regards the researches of Gray and Trumbull on this subject as very convincing; but since they do not discuss the species, he hopes that the seeds may be found among North American remains, in order to determine the latter. Nothing is known of the nativity of *C. ficifolia*, better known as *C. melanosperma*; De Candolle is of the opinion that it is American, since it is perennial, and all known Cucurbitaceous perennials come from Mexico and California.

Exhibitions.

Flower Show in Boston.

THE spring exhibition of the Massachusetts Horticultural Society is expected to bring together a display of bulbous plants, Indian Azaleas and other green-house and stove plants, and is considered one of the most important held by the Society during the year. In spite of the unusually favorable season, however, the exhibition in Boston last week was less interesting than many of those held in previous years. Many prominent Massachusetts gardens were not represented, and few novelties or remarkable plants were shown. Indian Azaleas did not form a conspicuous feature, although half a dozen compact little plants, shown by Dr. Charles Weld of Brookline, were well done. Larger plants were sent from the garden of Mr. N. T. Kidder, of Milton, but the flowers were not fully open, and lacked size and substance. The Orchids were few in number and not remarkable, and the bulbous plants, with the exception of Hyacinths, were below the average in quality. Of Hyacinths, however, the display was magnificent, Mr. Kidder staging as fine spikes of bloom as have ever been seen in Boston. From the same garden came a collection of Cinerarias in well-selected varieties and beautifully grown.

There was nothing in the exhibition, however, from a cultural point of view, to compare with the forty-eight cut Roses —Mervielle de Lyon, Baroness Rothschild and Her Majesty— shown by Miss Simpkins, of Yarmouth. Such flowers of Her Majesty have not been seen in Boston before. The Tea Roses, shown by Mr. Thomas Mead, of Dorchester, were wonderfully well grown, too. A great mass of *Primula obconica*, shaded with numerous small plants of *Cocos Weddelliana*, was contributed by Mr. Benjamin Grey, and showed the decorative value of these plants when used in this way. A collection of hardy spring-flowering plants, in pots and in flower (not very well flowered or arranged), were sent from the Cambridge Botanic Garden. This collection, judging by the number of people who constantly gathered about it, was the most attractive feature of the exhibition. Mention must be made of a fine seedling Rhododendron raised by Mr. James Comley, gardener to Mrs. F. B. Hayes, of Lexington. It is said to be a hybrid between *R. maximum* and some garden variety of *R. Catawbiense*, although the foliage shows no trace of the blood of the former species. The truss is large, compact and well-shaped, and the flowers are large, white, or faintly tinged with pink, and handsomely marked on the upper division of the corolla with pink spots. The plant is seven years old, and is now flowering for the first time. It has shown itself perfectly hardy, and if it proves to be a free bloomer and possessed of a good constitution and habit, it will make a valuable addition to the list of desirable hardy, Rhododendrons, among which there is none with light-colored flowers now known here quite equal to it, if it is fair to judge by the single trees exhibited.

Mr. F. L. Temple, of the Shady Hill Nurseries, exhibited two plants of the Japanese Umbrella Pine (*Sciadopytis*) imported from Japan; each eight or ten feet high, and perfectly furnished to the ground—interesting in themselves, as unusually fine specimens, and as showing how plants of this size can be imported successfully from Japan. R. & J. Farquhar & Co. showed Pansies of a good strain, and there was the excellent display of seasonable vegetables which is always seen at a Boston exhibition.

Recent Plant Portraits.

Cattleya Schilleriana, *Gartenflora*, January 15th.

Erythrophlœum pubistamineum, *Gartenflora*, January 15th.

Rhododendron arborescens, *Gartenflora*, January 15th; reproduced from Garden and Forest, vol. i., p. 401.

Cattleya Harrisoniæ, *Gardeners' Chronicle*, January 26th.

Cattleya Loddigesii, *Gardeners' Chronicle*, January 26th.

Ixianthes Retzioides, *Gardeners' Chronicle*, February 2d; a rare Cape shrub, with abundant bright sulphur-yellow flowers, in shape like those of Pentstemon.

Lilium martagon, var. atrosanguineum, *Bulletino della R. Soc. Toscana di Orticultura*, February.

Clematis Madame Furtado-Heine, *Revue Horticole*, March 1st; a variety with handsome violet-colored flowers, raised by a French horticulturist, M. Christen, of Versailles, by crossing one of the varieties of *C. lanuginosa* with *C. viticella rubra grandiflora*.

Chimonanthus fragrans, var. grandiflorus, *Gardeners' Chronicle*, February 23d.

Jasminum nudicaule, *Gardeners' Chronicle*, February 23d.

Abies bracteata, *Gardeners' Chronicle*, February 23d.

Notes.

The great summer horticultural exhibition at the Crystal Palace, near London, will open this year on the 11th of May.

The death is announced in England of the Rev. J. G. Wood, a very popular writer on natural history subjects. Most of his works have addressed themselves to students of animal life only, but his "Garden Friends and Foes" has a special interest for horticulturists.

At a recent meeting of the Horticultural Society of Paris a red-berried Mistletoe (*Viscum cruciatum*) was exhibited by Monsieur H. Luiseau. It is a native of Portugal, where it usually grows on the branches of the Olive-tree. Its leaves are cuneiform in shape and smaller than those of the common Mistletoe (*Viscum album*), and its berries are a bright crimson-red.

An English correspondent writes: There is little of interest in bloom out-of-doors, but in frames and cool-houses the European Cyclamens, Crocuses, Hepaticas, *Iris Persica*, *I. reticulata*, *Bongardia Rauwolfii*, with numerous kinds of Narcissus, are now in full blow. The Snowdrops, with their numerous names, but all looking alike at a distance of ten yards, are at their best, and so is the beautiful Snowflake.

The *Revue Horticole* calls attention to the merits of the new dwarf Polyantha Rose, Mademoiselle Blanche Rebatil, already figured in the *Journal des Roses*. The value of this introduction, which was raised by M. Alexandre Bernaix, near Lyons, in 1885, is the dark color of the flowers, something unknown before in this class, and a character which the raisers of new varieties will not be slow to take advantage of in improving this charming class of dwarf Roses.

English journals say that a fence about five feet high and of considerable extent which encircles the grounds of a new house erected for Baron Knopp at Forest Hill in the environs of London, is built entirely of "Jarrah timber," and "attracts considerable attention from the passers-by" as the "varied and delicate shades of the wood" are conspicuously ornamental. Jarrah timber is the wood of *Eucalyptus robusta*, var. *rostrata*, a native of western Australia.

M. Crépin has succeeded in obtaining from India a few seeds of the new climbing white-flowered *Rosa gigantea*, which, it is believed, is destined to become a valuable addition to our single Roses. The flowers are dazzling white and of enormous size. It is a native of Upper Burmah, a region where frosts are unkown, so that in the Northern States *Rosa gigantea* must be treated as a green-house climber; but in the Southern States it will doubtless prove perfectly hardy.

Some idea of the new class of demands made upon the American forests will be gained from the fact that a firm of wood-workers in one of the smaller towns of southern Illinois has recently received an order from St. Louis for forty million wooden butter-dishes. Its product last year was thirty-three million butter-dishes, besides immense numbers of fruit-boxes, sugar-buckets, etc. The principal wood used for this purpose in the Mississippi Valley States is Liquidamber or Sweet Gum (*Liquidambar Styraciflua*).

M. Cornu, Professor of Culture at the *Jardin des Plantes*, exhibited on the 28th of February, before the National Society of Horticulture of France, branches of *Prunus Davidiana*, *Pyrus baccata*, *Forsythia suspensa*, *Deutzia gracilis* and other shrubs, in full flower fully two months earlier than these plants bloom at Paris naturally. These early flowers were obtained by inserting branches, cut from plants growing in the open ground, in moist sand in a green-house where the temperature was maintained between 50° and 60°.

At Ribston Hall, Wethersby, a severe gale recently destroyed the beautiful *Abies Pinsapo*, which was one of the earliest specimens planted in England. It was thought to be about forty-five years old, was over forty-four feet in height, and at one foot from the ground girthed nearly twelve feet. Ribston Hall is the estate which gave us a well-known Apple, the Ribston Pippin. The seed of the original specimen is said to have come from Rouen in 1787, and this parent tree stood until a few years ago, while a sucker which sprang from its roots is still in existence.

The demand for Sycamore lumber, as the wood of *Platanus occidentalis* is called, is increasing very rapidly wherever tobacco is packed. This wood, which does not split readily, is now almost exclusively used in the United States for tobacco-boxes, and immense quantities are shipped to Richmond, St. Louis and other tobacco-packing centres. One mill on the Embarras River, in southern Illinois, has within a few months received orders for eleven million feet of this lumber; and mills through that part of the country are busy sawing up the great Sycamores, which once were the crowning feature of the country of the Illinois.

Mr. E. S. Goff reports, in *Agricultural Science*, some investigations upon the distribution of starch in the Potato tuber. The study was undertaken partly to ascertain whether any clue to a rational method of cutting Potatoes for seed could be discovered in this way. The test showed that the part richest in starch lies within the cambium-layer and adjacent to it, and that the portion lying nearest the so-called seed-end is richer in starch than that of the opposite end. Experiments have shown that cuttings from the seed-end yielded more than cuttings from the stem-end, but the greater vigor of the eyes at the seed-end as compared with those at the opposite end can hardly be accounted for by the slightly greater amount of starch in that part of the tuber. The only conclusion as to the method of cutting for seed seems to be that it is probably better to cut the tuber longitudinally, since transverse cutting would unequally divide the nutriment of the young plant.

A correspondent of a French botanical journal recently gave several recipes for preserving the color and form of dried flowers. One method is to immerse the stem of the fresh specimen in a solution of thirty-one parts by weight of alum, four of nitre and 186 of water for two or three days, until the liquid is thoroughly absorbed, and then to press in the ordinary way, except that dry sand is sifted over the specimen and the packet submitted to the action of gentle heat for twenty-four hours. Another method is to make a varnish composed of twenty parts of powdered copal and 500 parts of ether, powdered glass or sand being used to make the copal dissolve more readily. Into this solution the plants are carefully dipped; then they are allowed to dry for ten minutes, and the same process is repeated four or five times in succession. Plants may also be plunged in a boiling solution of one part of salicylic acid and 600 of alcohol, and then dried in bibulous paper. But this act should be very rapidly done, violet flowers especially being decolorized by more than an instantaneous immersion. Red flowers which have changed to a purplish tint in drying may have their color restored by laying them on a piece of paper moistened with dilute nitric acid (one part to ten or twelve parts of water), and then submitting them to moderate pressure for a few seconds. But this solution should never be allowed to touch the green leaves, as they would be decolorized by it.

An article on Danny Park, Sussex, the residence of Mr. W. H. Campion, which was recently published in the *Garden* (London), includes an illustration of a most remarkable tree. It is a specimen of our Cottonwood (*Populus monolifera*), and stands near the house, isolated on one side of a wide lawn. "It is probably," says the *Garden*, "one of the quaintest forms of tree-growth" that exists in England. There is no record to show when it was planted, but it must be at least a century old, for "the stem at two feet from the ground girths thirteen feet, the first branch starting about nine feet up the stem, while most of the others are found about two feet higher up," and the greatest spread of the branches being 150 feet. But the most remarkable thing about the tree is not its size, but the curious form it has assumed. Not only do all the lower branches droop so that they lie upon the ground, "but some of them have rooted, and the new roots, infusing fresh vigor into the branches, have caused rival leaders to shoot up, some of which have now attained a height almost equal to that of the parent tree. If these upstarts put out branches like the parent there will be some day a forest of stems, like those of the Banyan tree, which spreads and covers acres. But the Banyan supports its head upon straight stems, which are like a great array of pillars upholding some mighty dome, the ground being left free and scarcely obstructed. The Poplar does otherwise. Its branches form a confused labyrinth of stems, crossing and recrossing one another, entirely impeding the progress of anyone who would walk beneath its shade. . . . If, instead of winding in and out, the branches had all grown out straight from the stem, much more ground would have been covered, for the longest branch, though confusedly interwoven with the others, is forty-five yards in length, that being only five yards less than the greatest diameter of the branch spread. The tree also makes a large mass of distinct and noble-looking leafage, for the broad ovate leaves are nearly all about the size of one's hand." The picture shows the tree in winter, when its singular development of course appears most clearly. It is protected by a railing, but a winding path leads to the central space near the trunk, which in summer must be a thickly over-shadowed bower of considerable size.